

Prospects and feasibility of involvement of fallow lands in organic agricultural production

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Abstract. The study is devoted to assessing the relevance of the use of fallow and unused land for the production of organic products. The paper shows that this is a promising direction for solving agro-industrial and food problems. The growth of the world market of organic products and the importance of transition to sustainable agriculture are emphasised. Involvement of unused land contributes to the improvement of ecology, soil fertility and development of rural areas. The study focuses on Altai Krai, a region with high agrarian potential but low level of agricultural intensification. It substantiates the need to develop strategies to stimulate organic farming and rational land use. The work is an analysis, development of a regional programme, calculation of forecast values and evaluation of the effectiveness of the proposed measures, based on the analysis of literature, regional data, systematic approach and application of various research methods, including calculative-constructive and economic-mathematical. The result of the work is to substantiate the feasibility of involving fallow lands in agricultural turnover for the production of organic products.

1 Introduction

The solution of modern problems of agro-industrial complex and food security problems through the use of fallow and unused land for the production of organic products seems particularly promising. This approach allows not only to meet the growing demand for organic products, but also to solve the problem of irrational use of land. Involvement of such land in agricultural turnover contributes to the improvement of the environment, increase soil fertility, biodiversity conservation, as well as provides an opportunity to provide employment for the rural population, and contributes to the socio-economic development of regions. Thus, this approach combines environmental sustainability, economic efficiency and social relevance. At the same time, an important aspect is the assessment of the impact of different land use practices on soil, especially when switching to organic production [1].

The global market for organic products is experiencing rapid growth, and this is not just a fashion trend, but a reflection of consumers' growing awareness of the link between nutritional quality, health and environmental sustainability. According to FiBL and IFOAM, the global organic market is expected to reach €124 billion in 2021, growing at an annual rate of 10-15%. This trend is driven not only by increasing demand from consumers, but also by governmental realisation of

the need to move towards more sustainable farming practices. Organic farming is not just an alternative to conventional methods, but also a tool for ensuring food security in the long term by ensuring sustainable management of resources, including water and soil. It contributes to the conservation of biodiversity, reduces environmental pollution from the use of pesticides and synthetic fertilisers, and creates favourable conditions for the development of rural areas. At the same time, the transition to organic farming faces certain challenges, including the need to improve technologies, human resources and access of producers to markets. Different approaches to the development of organic agriculture, both globally and regionally, involve different trade-offs between environmental, economic and social objectives. The introduction of biological methods of plant protection and organic fertilisers, as well as the use of renewable energy sources on farms require significant investment in research and development, and regulation of this process through a legislative framework [2]. The integration of ecological principles into traditional farming systems, although less radical, also requires changes in habitual practices and adaptation to new conditions.

In this context, given the need to adapt agriculture to the changing climate [3], and the introduction of sustainable technologies to reduce dependence on resources, the involvement of fallow and unused land in organic production is very promising [4]. World data indicate that there are significant areas of such lands that

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can be used for organic farming. According to FAO estimates, there are more than 2 billion hectares of degraded land in the world, potentially suitable for restoration and use in agriculture, including organic agriculture. With the right approach, involving these lands into circulation not only increases organic production, but also helps to restore soil fertility and reduce erosion. Such an approach opens up opportunities for the creation of new jobs in rural areas, reduces the outflow of population from rural areas and contributes to their socio-economic development. However, the development of fallow lands may require additional investment in their treatment and preparation, as well as the development of specialised technologies for their cultivation. An important aspect is the use of biological preparations to maintain soil fertility [5].

In light of the above, the relevance of the selected research area is due to the fact that the Russian Federation, and in particular Altai Krai, has a significant but underutilised potential for the development of organic agriculture. Thus, according to Rosstat, in 2021 the area of agricultural land in Russia was about 197 million hectares, of which a significant part was arable land. At the same time, the share of organically certified agricultural land in Russia in 2020 was less than 0.2%, which indicates a significant reserve for the development of this area. Altai Krai, with its rich soil resources and centuries-old agrarian traditions, stands out against this background as one of the most promising regions for the development of organic agriculture. The region holds leading positions in terms of arable land area (6.5 million hectares) in Russia, with the predominance of fertile chernozems. At the same time, the level of intensification and chemicalisation in agriculture in Altai Krai remains relatively low compared to European countries: while the average application of mineral fertilisers in the Eurozone is 192 kg/ha, in Altai Krai this indicator is only 3.8 kg/ha, which creates favourable conditions for the transition to organic farming methods. On this basis, the development of comprehensive strategies and mechanisms aimed at stimulating organic agriculture, with a focus on the rational use of fallow land, is not only timely, but also critical to ensure food security, improve the environmental situation and stimulate sustainable socio-economic development of the region. The problem of unused land is relevant, since according to the Ministry of Agriculture of the Russian Federation, the total area of unused agricultural land in the Central Federal District alone exceeds 1.5 million hectares. A similar situation is typical for other regions of Russia, which only emphasises the importance of the study of this topic, especially under the influence of mountain factors on the soil [6]. The purpose of this work is to substantiate the possibility and feasibility of involving fallow and unused lands of Altai future results.

2 Method and materials

Within the framework of the presented research, a set of works was carried out to study the possibility of involving fallow and unused land into agricultural

turnover for the production of organic products. These works included several key stages: analysis of theoretical and methodological basis, development of a regional target programme, calculation of forecast production values, as well as assessment of the economic and environmental effect of the proposed measures. At the initial stage of the research, the scientific literature on the problems of organic farming, development of land relations, as well as regulatory and legal acts, including legislative acts of the Russian Federation and regulations of the European Union concerning organic farming were analysed. The system approach was used as a methodological basis, which allowed to ensure the comprehensiveness and purposefulness of the study. Analytical, abstract-logical, calculative-constructive, economic-statistical, economic-mathematical and monographic methods were applied. In the process of developing the regional target programme, the results of the analysis of regional peculiarities of Altai Krai, including socio-economic conditions, as well as the available resource and land potential were used. Determination of specific parameters of the programme, such as targets for land involvement in the turnover, the volume of subsidies and projected volumes of organic production, was carried out using the calculation and construction method. Economic calculations were carried out to assess the effectiveness of the proposed measures, taking into account the costs of land preparation, purchase of equipment, and other production costs. To estimate the potential volumes of organic production, the article used a forecast calculation for the period 2017-2027. This forecast was based on data on the area of arable land, its fertility and planned yields, taking into account the possible increase in the share of organic production. For the calculation, economic and mathematical methods were used, in particular, the method of expert evaluations and methods of statistical analysis, as well as methods of crop rotation planning [7] identifying the potential and justifying the feasibility of involving fallow land in agricultural turnover, rather than on the study of specific agro-technical methods or soil characteristics. Consequently, there is no information on specific types, brands of equipment and modes of operation, as this work was theoretical and economic in nature.

3 Results and discussion

The work on involvement of unutilised land began with an assessment of available resources, reserve arable land that was not used for production purposes was identified and mapped, including the allocation of land shares. According to the results of the analysis, the total area of identified unused arable land was 540 thousand hectares, of which 401 thousand hectares were allocated as land shares. This confirmed the hypothesis that there is a significant potential to expand production through the involvement of these reserves. The suitability of the identified lands for production was assessed, identifying factors that prevented their utilisation, including lack of infrastructure, reclamation deficiencies or low soil

fertility. At subsequent stages, mechanisms were developed to compensate land users for the costs of bringing unused land into production. The project envisaged subsidising part of the costs of tillage work to engage unused arable land, namely RUB 2,000 per hectare, which, according to calculations, covers the cost of 60 litres of diesel fuel. As a result of these measures, it was planned to gradually increase the area of arable land brought into agricultural turnover. Thus, by 2022 it was planned to involve into production 207 thousand hectares of unused arable land and 110 thousand hectares of fallow land. The authors paid attention to the maintenance and restoration of soil fertility, including reclamation measures, which contributed to the increase in land productivity, including through the use of biological preparations. Based on the results obtained, the dynamics of changes in the area of utilised arable land was assessed, which was planned to increase from 6307 thousand hectares in 2017 to 6626 thousand hectares in 2022, and measures for its rational use, including land use structure planning, were identified and proposed. At the same time, attention was emphasised on the need for state control over the use of agricultural land resources, providing for regular inspections of compliance with land legislation with a coverage of 100 per cent by 2022. Geo-ecological assessment of land is also necessary [8]. In order to ensure the resource base of the project, sources of funding were identified. A total of RUB 70 million was allocated for the programme in 2017, with a subsequent increase to RUB 523 million in 2018. The main sources of funding were the regional budget, which provided RUR 102 million in 2022, and extra-budgetary sources in the amount of RUR 173 million in 2022. Projected volumes of budget subsidies for the involvement of reserve lands totalled RUB 26 million in 2017, with an increase to RUB 295 million in 2018 and a further decrease to RUB 102 million in 2022. Total investments in the project implementation until 2022 totalled 1,060 million rubles. Forecasting the development of agriculture in Altai Krai was the key focus of this study. Special attention was paid to the production of major crops and livestock products, with a focus on the prospects of organic production. As a result of the analysis and modelling, a forecast was developed, according to which by 2027 the total production of grain crops in Altai Krai was to be 5800 thousand tonnes. At the same time, a significant part of this volume, namely 590 thousand tonnes, was to be organic production, which is 10.2% of total cereal production. It is estimated that in the structure of cereal production a significant contribution was to be made by crops such as wheat, barley, rye and oats, with a projected average cereal yield for 2027 of 26 centners per hectare with a total sown area of 2.2 million hectares. Moreover, the dynamics of organic farming development was projected to manifest itself in the growth of organic flax production, reaching 11.4 per cent of the total production of this crop, and organic sugar beet, where this figure was planned at 11.5 per cent. These figures demonstrate the potential for the development of organic farming in the region. Sunflower production, an important oilseed

crop for Altai Krai, should reach 475 thousand tonnes by 2027, with an organic share of 11.7%. This figure, as well as the average sunflower yield of 16 quintals per hectare with a sown area of 297 thousand hectares, indicates a significant resource for expanding its production. In addition, the projected potato production by 2027 is estimated at 995 thousand tonnes, and 15.1% of this volume should be organic potatoes, demonstrating the growing demand for organic products, while it is important to take into account the opinion of consumers [9]. The total area under potatoes in the region is about 50 thousand hectares. The implementation of these plans in the field of crop production is expected through the involvement in the turnover of unused agricultural land, which is estimated at about 300 thousand hectares, as well as through the introduction of modern organic agrotechnologies, including the use of organic fertilisers and biological plant protection methods. Special attention is paid to forecasting the development of livestock breeding. In particular, an increase in milk production to 1720 thousand tonnes by 2027, including 210 thousand tonnes of organic milk, which is 12.2% of total production. The average milk yield per cow should reach 7,500 kilogrammes per year. Meat production, in turn, was projected to reach 440,000 tonnes, including 60,000 tonnes of organic meat, representing 13.6% of total production. Projected meat production includes cattle, pork, poultry and mutton, with the total livestock population in the region estimated at 2 million head. These figures indicate significant prospects for the development of organic livestock production in the region. The key factors of growth in this area were to increase the number of livestock, increase productivity, as well as the development of the fodder base through organic farming. At the same time, it is important to ensure the rational use of resources, including waste [10], and the creation of conditions for economic development [11]. These forecasts are based on the data provided by the Ministry of Agriculture of Altai Krai and the Federal State Statistics Service, as well as on the analysis of trends in the development of the agricultural sector in Russia and abroad. In comparison with other similar studies conducted in other Russian regions and countries, it can be noted that the involvement of unused land in agricultural turnover is an urgent task for many territories. For example, in the regions of Central Russia, according to the Ministry of Agriculture of the Russian Federation, there are significant areas of unused arable land that could be used for the production of organic products. At the same time, studies conducted in European countries have shown that the transition to organic agriculture contributes to improving the environmental situation, increasing soil fertility and reducing the negative impact on the environment. As an additional aspect, it is necessary to note the importance of agro-ecological expertise of lands before their involvement in turnover. This will minimise the risks of soil degradation and preserve soil fertility. Also, it is important to carry out monitoring of soil resources [12]. Also fallow and unused lands. The obtained results and proposed recommendations can be used to develop similar programmes in other regions of Russia, as well as

for the formation of sustainable agro-ecosystems. According to estimates based on data on global trends in organic production, the share of organic products in total production can be higher with active promotion in the markets. For example, in European countries the share of organic products in some segments reaches 20-30%, which shows the potential for growth and in the Altai Krai. The study of global experience has shown that the use of modern agro-technologies and marketing strategies can achieve higher performance. The study also found that the value of gross agricultural output produced in Altai Krai should increase to 182 billion rubles in 2027, which corresponds to 155% of the 2015 level. The level of profitability of agricultural organisations was planned to increase to 20% by 2027, which would exceed the 2015 figure by 11.3%. These data reflect the economic efficiency of the proposed measures for the involvement of fallow lands and the development of organic agriculture.

4 Conclusion

The research presented in this article highlights the significant potential of organic agriculture to address food security and land management issues, especially in the context of the involvement of fallow and unused land. The global market for organic products is showing steady growth, reflecting consumer demand for organic products and government support for sustainable agricultural practices. The authors note that organic agriculture is not only an alternative to conventional agriculture, but also an important tool to ensure food security in the long term, contributing to the conservation of biodiversity, reduction of environmental pollution and development of rural areas. In Russia, especially in Altai Krai, with its vast land resources and relatively low level of agricultural intensification, there is a huge potential for the development of organic farming. The article emphasises that the share of organically certified land in Russia remains extremely low, which indicates significant reserves for growth in this direction. In Altai Krai, with its fertile chernozems and relatively low use of mineral fertilisers, there are favourable conditions for the transition to organic methods. The study emphasises the need to develop comprehensive strategies aimed at stimulating organic agriculture, in particular through the involvement of fallow lands in the turnover, which is key to ensuring food security, improving the environmental situation and stimulating socio-economic development of the region.

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